

REMARKSClaim Rejections under 35 USC § 103:

Claims 1-9 stand rejected under 35 U.S.C. §103(a) as obvious over Mohrschladt et al. (US 6,316,588) or Mohrschladt et al. (US 6,288,207).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

**I. No suggestion or motivation**

There is no suggestion or motivation to modify the disclosures of the cited references to utilize a titanium dioxide catalyst with a BET surface area in the range from 5 to 35 m<sup>2</sup>/g, because the references teach away from such a modification. As admitted by the examiner “both references expressly teach that [if] catalysts with lower BET [surface areas are used] ... the volume of the catalyst bed should be increased to maintain the appropriate catalytic activity.”<sup>1</sup> Thus, reducing the BET surface area of the titanium dioxide catalyst would be to proceed contrary to accepted wisdom in the art. Why would a person of ordinary skill in the art have proceeded so as to reduce the catalytic activity and necessitate an increase in the required volume of the catalyst bed?

The examiner suggests three possible reasons, none of which are convincing:

1. The examiner asserted that it would have been obvious to reduce the BET surface area “in processes where the catalytic activity is not critical.”<sup>2</sup> It is respectfully submitted that the catalytic activity is critical in the relevant process, namely a process for preparing a polyamide by reacting a mixture which comprises a monomer which has a nitrile group and has at least one other functional group capable of forming a carboxamide group, and

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<sup>1</sup> Page 2 at lines 21 – 23 of the non-final Office action of August 31, 2006.

<sup>2</sup> Page 3 at line 6 of the non-final Office action of August 31, 2006.

comprises water, in the presence of titanium dioxide as catalyst, which comprises using titanium dioxide whose BET surface area, determined to the German standard DIN 66 131 volumetrically by the multipoint method, is in the range from 5 to 35 m<sup>2</sup>/g. Thus, this purported motivation for a person of ordinary skill in the art at the time the invention was made to proceed contrary to the accepted wisdom of maximizing catalytic activity while minimizing the volume of the catalyst bed is unconvincing.

2. Next, the examiner asserted that it would have been obvious to reduce the BET surface area and compensate by “using higher bed volume as expressly taught by the reference.”<sup>3</sup> This assertion ignores accepted wisdom. A person of ordinary skill in the art at the time the invention was made would have needed a strong suggestion or motivation to proceed contrary to the accepted wisdom of maximizing catalytic activity while minimizing the volume of the catalyst bed.
3. Finally, the examiner asserted that it would have been obvious to reduce the BET surface area, arguing “[a]lso it maybe used [*sic*] as catalyst with lower BET surface area are [*sic*] generally less costly [*sic*].” Neither the examiner nor the cited references provide information that would have been available to the person of ordinary skill in the art at the time the invention was made showing comparative costs of titanium dioxide catalysts with various BET surface areas. Moreover, assuming for the sake of argument that the person of ordinary skill in the art at the time the invention was made had information suggesting that relevant titanium dioxide catalysts with lower BET surface areas were less costly, neither the examiner nor the cited references provide information that would have been available to the person of ordinary skill in the art at the time the invention was made, showing that any purported cost savings associated with using a titanium dioxide catalyst with a lower BET surface area would have offset the cost increases associated with the necessity of increasing the volume of the catalyst bed “to maintain the appropriate catalytic activity.”<sup>4</sup> Thus, this purported motivation for a person of ordinary skill in the art at the time the invention was made to proceed contrary to the accepted wisdom of maximizing catalytic activity while minimizing the volume of the catalyst bed is unconvincing.

It is respectfully noted that “[t]he totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness.”<sup>5</sup>

Neither the examiner nor the cited references provide motivation for a person of ordinary skill in the art at the time the invention was made to proceed contrary to the accepted

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<sup>3</sup> Page 3 at lines 6 – 7 of the non-final Office action of August 31, 2006.

<sup>4</sup> Page 2 at lines 21 – 23 of the non-final Office action of August 31, 2006.

<sup>5</sup> MPEP §2145, citing: *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986) (Applicant's claimed process for sulfonating diphenyl sulfone at a temperature above 127°C was contrary to accepted wisdom because the prior art as a whole suggested using lower temperatures for optimum results as evidenced by charring, decomposition, or reduced yields at higher temperatures.).

wisdom of maximizing catalytic activity while minimizing the volume of the catalyst bed.

“Furthermore, ‘[k]nown disadvantages in old devices which would naturally discourage search for new inventions may be taken into account in determining obviousness.’”<sup>6</sup> The examiner has admitted that at the time of the invention at least one known disadvantage existed in titanium dioxide catalysts, namely that a reduction in BET surface area was expected to result in a decrease in catalytic activity, thereby requiring a larger bed volume. A person of ordinary skill in the art, at the time the invention was made would have viewed this as a major disadvantage. Such skilled artisans would not have modified the disclosures of the cited references, because the skilled artisans would have sought to avoid this known disadvantage.

It is respectfully noted that, when making an obviousness determination, “[t]he references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination.”<sup>7</sup> In other words, desirability and obviousness are inextricably linked. The Federal Circuit in *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) stated that a cited art reference that criticizes, discredits, or otherwise discourages the solution claimed teaches away. A new invention cannot be obvious, if a person of ordinary skill in the art at the time the invention was made would not have made the invention because they would have expected undesirable results. That’s why “secondary considerations such as unexpected results... are relevant to the issue of obviousness and must be considered in every case in which they are present.”<sup>8</sup> However, when cited references disclose that the proposed modification/combination would result in undesirable results, the reference teaches away from the modification/combination, a *prima facie* case of obviousness has not been established and a showing of unexpected results is unnecessary. A skilled artisan would have expected the claimed invention to be undesirable because, as admitted by the examiner, the skilled artisan would have expected a reduction in BET surface area to result in a decrease in catalytic activity,

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<sup>6</sup> MPEP §2145, quoting: *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966).

<sup>7</sup> *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

<sup>8</sup> *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 USPQ 81 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987).

thereby requiring a larger bed volume. Thus, the inventors have made a nonobvious contribution by breaking through the boundaries of desirability imposed by the prior art.

Thus, a *prima facie* case of obviousness has not been established. There was no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references to arrive at the claimed invention. For this reason, alone, a *prima facie* case of obviousness has not been established.

## **II. No expectation of Success.**

Next, in order to establish a *prima facie* case of obviousness, there must be a reasonable expectation of success. In this regard, the examiner has applied an erroneous legal standard, stating that “use of such a catalyst is within purview [*sic*] of the reference and would have been obvious with reasonable expectation [*sic*] of adequate results (emphasis added).”<sup>9</sup> An expectation of adequate results is insufficient. The person of ordinary skill in the art at the time the invention was made needs to have had a reasonable expectation of success. A person of ordinary skill in the art, at the time the invention was made, would not have reasonably expected the examiner’s proposed modifications to the cited references to result in success. The examiner’s statement that a person of ordinary skill in the art would expect merely adequate results constitutes an admission that the skilled artisan would not have had a reasonable expectation of success. Thus, a *prima facie* case of obviousness has not been established.

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<sup>9</sup> Page 4 of the non-final Office action of August 31, 2006.

### III. All claim limitations are not taught or suggested.

The US 6,316,588 reference states: “The BET surface area is preferably more than 40 m<sup>2</sup>/g, particularly preferably more than 100 m<sup>2</sup>/g. If the BET surface area is smaller, the bed volume should be appropriately higher to ensure adequate catalyst activity.”<sup>10</sup> Clearly the claimed range of BET surface areas (from 5 to 35 m<sup>2</sup>/g) is not disclosed. The phrase, “[i]f the BET surface area is smaller ...” does not teach or suggest the claim limitation that the BET surface area must be in the range from 5 to 35 m<sup>2</sup>/g. When the disclosure of US 6,316,588 is properly considered as whole,<sup>11</sup> it is erroneous to argue that BET surface areas less than 40 m<sup>2</sup>/g are taught or suggested, let alone BET surface areas less than or equal to 35 m<sup>2</sup>/g. Such an argument is based entirely on impermissible hindsight. A skilled artisan, at the time the invention was made, would not have had the present application as a guide to interpret the phrase, “[i]f the BET surface area is smaller ...” as the Examiner does. The Examiner has improperly cherry-picked from the references, using the present application as a guide. In so doing, the Examiner has failed to examine the references as a whole as required, and has relied on impermissible hindsight.

Unlike the Examiner, the skilled artisan would have had no reason to completely abandon the disclosed range of surface areas and arrive at a range of from 5 to 35 m<sup>2</sup>/g. The references provide no teaching or suggestion toward this claimed range. In fact by disclosing that higher BET surface areas (more than 100 m<sup>2</sup>/g)<sup>12</sup> are more particularly preferred than lower BET surface areas (more than 40 m<sup>2</sup>/g)<sup>13</sup> the references point in precisely the opposite direction. To establish *prima facie* obviousness of a claimed invention, **all** the claim limitations must be suggested by the prior art (*See, In re Royka*, 490 F.2d 981 (CCPA 1974)). Clearly, **all** the claim limitations are not **taught or suggested**. Thus, a *prima facie* case of obviousness has not been established.

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<sup>10</sup> Column 6, line 67 through column 7, lines 1 -4 of US 6,316,588.

<sup>11</sup> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention (*W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983)).

<sup>12</sup> Column 7, lines 1 – 2 of US 6,316,588.

<sup>13</sup> Column 7, lines 1 – 2 of US 6,316,588.

## Regarding Unexpected Results

The examiner's discussion regarding the showing of unexpected results is moot, because a *prima facie* case of obviousness has not been established. However, the examiner's statements regarding the unexpected results are erroneous. The following unexpected results were obtained:

1. A reduction in BET surface area to the range of from 5 to 35 m<sup>2</sup>/g of titanium dioxide catalyst in the claimed process did not necessitate a larger bed volume and therefore did not result in a reduction of catalyst activity.

The present specification discloses: Comparative Example 1 (CE1), Example 1 (E1), and Example 2 (E2) which were performed one after another using not just similar titanium dioxide pellets, but precisely the same titanium dioxide pellets. The titanium dioxide pellets were first used in CE1. When used in CE1 the titanium dioxide pellets had a BET surface area of 50 m<sup>2</sup>/g. Subsequently, “[t]he titanium dioxide pellets used in comparative example 1 were heat-conditioned at 500°C for 20 hours ... [until they] had a BET surface area of 30 m<sup>2</sup>/g.”<sup>14</sup> These pellets were then used in E2 after modifications to the reactor.

Thus, when the full details of the examples disclosed in the present specification are considered, the examiner's assertion that there is “not a single evidence [*sic*] on the record that, in fact, the catalytic activity of the claimed catalyst is the same as the catalyst expressly disclosed in the reference” is revealed to be erroneous.

2. A reduction in BET surface area to the range of from 5 to 35 m<sup>2</sup>/g of titanium dioxide catalyst in the process of claim 1 did not result in a larger amount of titanium dioxide being incorporated into the polymer. In fact, a lower amount of titanium dioxide was incorporated into the polymer. These results are clearly shown in Table 1.

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<sup>14</sup> Page 15 of the present specification at indicated lines 10 – 15.

Regarding the examiner's assertion that the showing of unexpected results is not commensurate in scope with the claimed invention, it is respectfully noted that "[t]o establish unexpected results over a claimed range, applicants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range."<sup>15</sup> It is respectfully submitted, that applicants have compared a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. Comparative example 1 utilizes titanium dioxide pellets with a BET surface area of 50 m<sup>2</sup>/g. Subsequently, "[t]he titanium dioxide pellets used in comparative example 1 were heat-conditioned at 500°C for 20 hours ... [until they] had a BET surface area of 30 m<sup>2</sup>/g,"<sup>16</sup> and were then used in Example 1. This comparison shows the criticality of the claimed range, because "[t]he nonobviousness of a broader claimed range can be supported by evidence based on unexpected results from testing a narrower range if one of ordinary skill in the art would be able to determine a trend in the exemplified data which would allow the artisan to reasonably extend the probative value thereof."<sup>17</sup> The trend to be demonstrated is very straightforward in this instance. The cited references erroneously disclosed a preference for titanium dioxide catalyst with higher BET surface areas on the basis that the bed volume must be increased to ensure adequate catalyst activity. The exemplary data in the present specification demonstrates that a catalyst with a BET surface area within the claimed range did not result in a decrease in catalytic activity. One of ordinary skill in the art would be able to identify this simple trend in the data presented in the present application. The skilled artisan would note that when catalyst with a BET surface area within the claimed range is utilized an unexpected result is achieved.

The reference discloses that the particularly preferred BET surface area is above 100 m<sup>2</sup>/g, thus comparison of the claimed invention to a catalyst with a BET surface area of 50 m<sup>2</sup>/g is sufficient to inform a person of ordinary skill of the unexpected results. Yet the examiner commented that "[t]he lower expressly disclosed BET surface area is 40 m<sup>2</sup>/g (even in examples it is 46) and not 50 as used in the comparative examples of the

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<sup>15</sup> MPEP 716.02(d), citing *In re Hill*, 284 F.2d 955, 128 USPQ 197 (CCPA 1960).

<sup>16</sup> Page 15 of the present specification at indicated lines 10 – 15.

<sup>17</sup> MPEP 716.02(d), citing *In re Kollman*, 595 F.2d 48, 201 USPQ 193 (CCPA 1979).

instant application.”<sup>18</sup> It is respectfully noted that a comparison of a catalyst with BET surface area of 50 m<sup>2</sup>/g (i.e., at the far, lower end of the broad range disclosed in the cited references) and a catalyst solidly within the claimed range would provide sufficient data for a skilled artisan to determine that unexpected results were achieved by the Applicants, especially when the particularly preferred BET surface areas disclosed in the cited references are at the opposite end of the broad range disclosed.

Conclusion:

Applicants respectfully submit that the present application is in condition for allowance, which action is courteously requested.

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<sup>18</sup> Page 4, lines 15 – 17 of the non-final Office action of August 31, 2006.